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World Grain Stocks

Where They Are and How They Are Used

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World grain stocks rapidly declined from record high levels in 1986. By late 1989, the world's carryover stocks-to-use ratio approached historic lows. But this decline is expected to be temporary. Stocks in most countries tend not to be available for use outside the country. Consequently, the United States holds the bulk of the world grain market's residual supply of stocks. Grain stock levels and locations around the world could be heavily influenced by farm policy decisions made in the United States and international trade negotiations.

The world's grain stocks, often called reserves, provide vital protection against future shortages. They also protect national economies against the destabilizing effects of volatile world grain prices. That protection diminished considerably in 1988 and 1989 as the world's grain stocks rapidly dwindled. The low global stock level likely is a temporary problem. As in the past, grain production should respond to the higher grain prices and stocks should increase.

The low grain stock levels again raise questions of how the world's grain stocks are managed. There is no world agency in charge of managing the world's grain reserve. Global stock levels are determined by the sum of decisions by people and governments. Thus, in order to understand how global stocks are managed, one needs to examine policies and practices of the main stockholding countries/regions: United States, Soviet Union, China, India, the European Community, and Canada. Stocks in China, India, and the Soviet Union are held primarily for domestic use. Stocks in the United States, EC, and Canada tend to be available to the world market. The United States also has idled cropland that can quickly be brought into production. As a result of the stocks and idled cropland, the United States holds a large share of the world's insurance against grain shortages.

Even though global stock levels result from each country pursuing its own interests, there is much interdependency in the management of the world's stocks. A grains policy change by any major stockholding country, especially the United States, could have a big effect on world stock levels and stockholding decisions of all countries.

Figure 1
World grain stocks

Grain stocks dropped sharply after a record high in 1987.

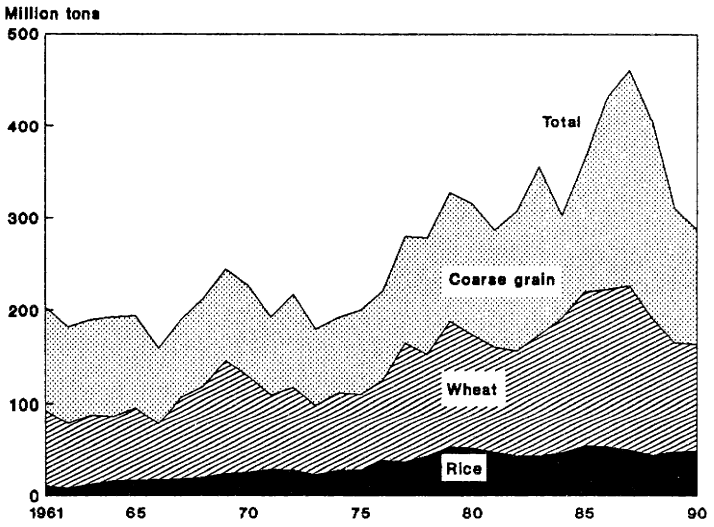
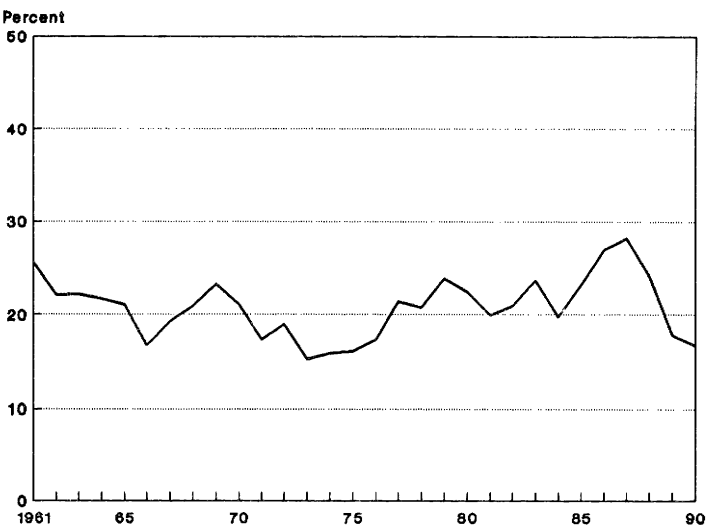


Figure 2
World grain stocks as percentage of consumption

Global stocks are at their lowest level since early 1970's.



Low world stocks: A concern now, but not indicative of a longrun global problem

The low levels of world grain stocks in 1989 meant that the world had less insurance against poor crops of grain in the near future. But, the recent rapid decline in stocks is not evidence that the world is headed for an extended period of chronic grain shortages.

World grain stocks were at record-high levels by the end of the 1985/86 grain marketing year. Over the next 2 years, however, there was a marked decrease in the world's year-ending stocks. By the end of the 1988/89 marketing year, the ratio of global ending stocks to global grain consumption had dropped to near the record lows of the early 1970's. Further decline is expected in 1989/90. Another year of below-average world production of grain would strain world grain markets. Grain importing countries have reason for concern. So does the United States. But, as discussed later in this report, markets and country policies likely will respond as in the past to the low stock levels and higher market prices, and stocks once again will increase.

Why worry about low levels of world grain stocks? There are two types of concerns: temporary grain shortages and high grain prices. The first is of primary concern to grain importing countries, especially poor countries. Grain stocks are insurance against temporary shortages in the future. Countries that are poor and import a large proportion of their grain needs could lose out when a global shortage arises. These poor countries are at risk when people in wealthy countries are able to out-bid them for scarce grain. This is a life-or-death matter to some of their citizens. Social and economic stability of these countries are also threatened.

The second concern, very high grain prices resulting from temporary global shortages, are of direct concern to a grain exporting country such as the United States. During the temporary global shortage of the early 1970's, U.S. grain prices more than tripled. Economists considered this to be one of the important causes of the high rate of inflation and the associated economic instability of the period; both strained the economy at a considerable economic cost.

The recent sharp drop in stocks should be viewed as a near-term (several years) problem, caused by shortrun events. Grain production sharply declined in 1987 and 1988. The main reasons for the recent sharp decline in global production and stocks were (1) lower yields due to droughts in several major producing areas, (2) decisions to reduce plantings in some countries due to low prices, and (3) decisions by several governments, especially the United States, to reduce stocks. History shows that droughts periodically happen. The latter two reasons for the stock decrease, however, were in response to the record large stock levels and the associated low world grain prices in 1985. These private and government decisions also can respond to grain shortages and lead to increased production and stocks.

The rapid drop in world grain stocks does not mean that the world is headed for chronic longrun shortages or that global stocks are trending downward. There is no evidence of a downward trend in the world stocks-to-consumption ratio since 1960. Data since then show, however, that global stock levels are highly variable, as they should be if they are effective in offsetting production variability. There have been many examples of significant declines followed by stock buildup. Policy changes and higher world grain prices likely will encourage an expanded area planted to grain and world stocks will rebuild, if yields are near normal, in the early 1990's as they have in the past.

Figure 3

World wheat and rice stocks as percentage of consumption

Relative to consumption, wheat stocks have dropped to record low levels since 1987; rice stocks have also declined.

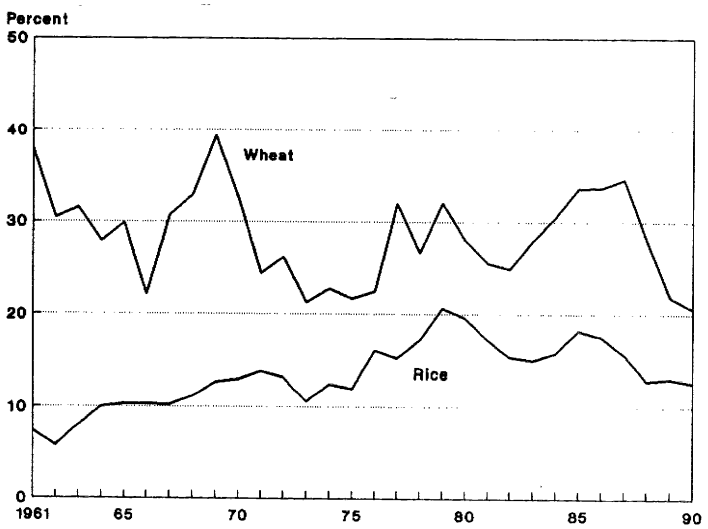


Figure 4

World coarse grain stocks as percentage of consumption

Coarse grain stocks fell to below-normal levels in 1989 after reaching a record high in 1987.

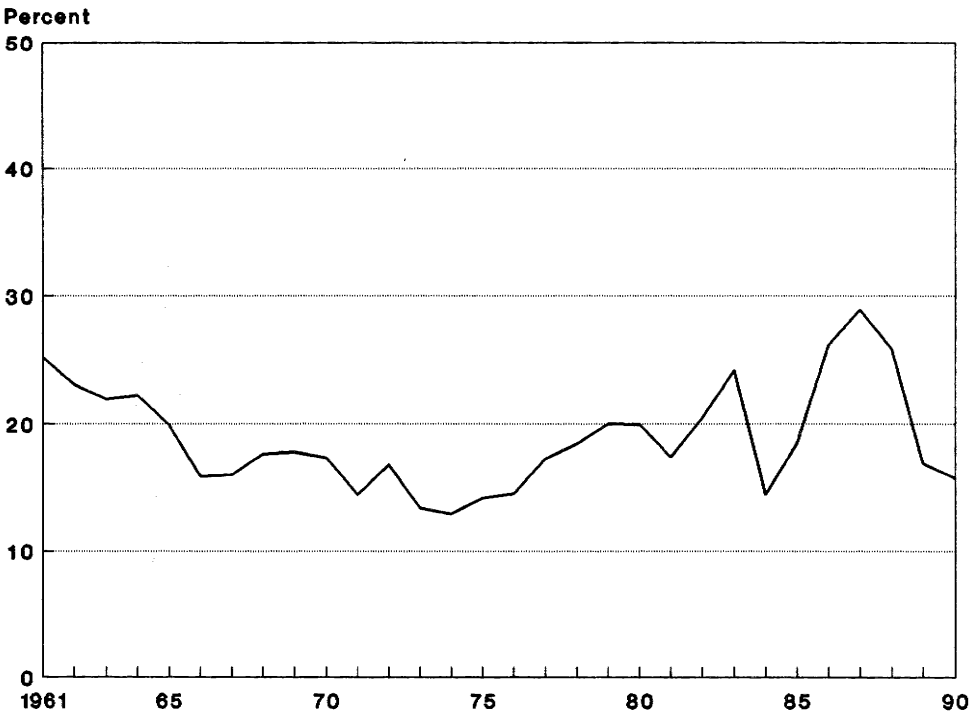
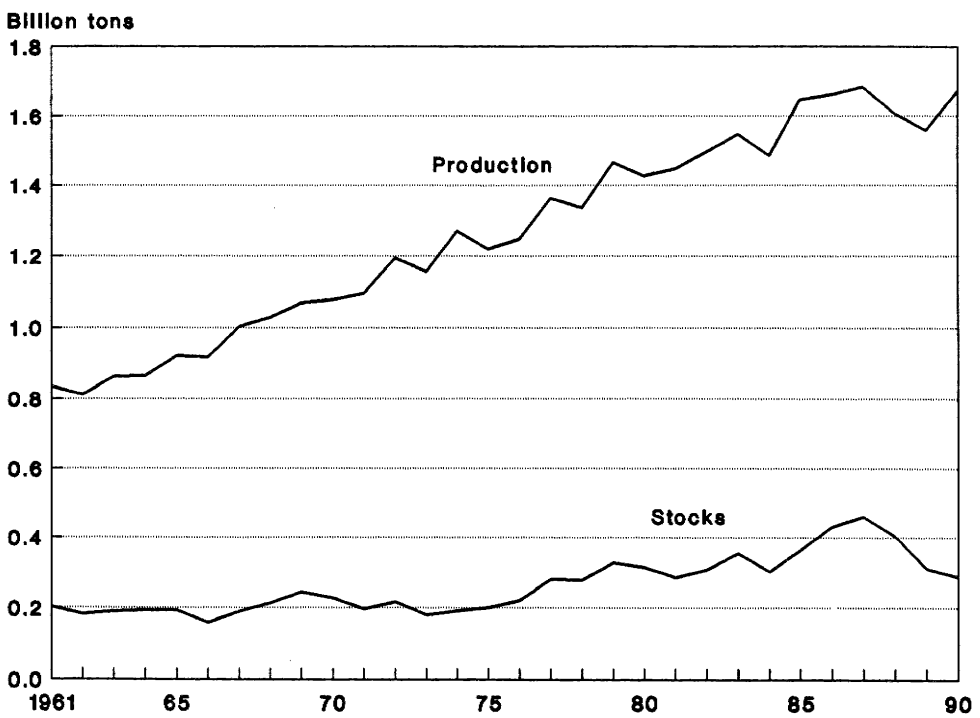


Figure 5

World grain production and stocks

The large reduction in world grain production in the 1980's reduced stocks.



Grain stocks: A complicated subject

When we relate grain stocks to the world's food reserves, we are implicitly dealing with some issues that are more complex than first appears.

It is useful to review four concepts relating to grain stocks and their role in the world's food reserve. They are: what kinds of grain should be included; how stocks are measured; the key role of "carryover" stocks; and substitutes for grain stocks. With these concepts in mind, we can better evaluate the meaning of changes of world grain stock levels.

Why lump the various grain types together? In this report, "grain" refers to the total of many types of grain. Grains are usually divided into two categories: food grain (wheat and rice) and coarse grain (corn, grain sorghum, oats, barley, rye, and some other grains used for feed). In the United States, the term "feed grains" refers to corn, grain sorghum, oats, and barley.

It is legitimate to consider aggregate "grain" stocks as a broad measure of food security and a source of general grain price stability. When one type of grain is in short supply and there are emergency needs, other grains can be substituted. For example, wheat and rice are both food grains and many people are willing to consume one when the other is scarce. Likewise, the coarse grains substitute for each other in livestock feed. There also is some additional human consumption of coarse grains when food grains are not available. And animals can consume additional food grains when coarse grains are scarce. Evidence of this substitution is the fact that world grain prices tend to move up and down together.

How are stocks measured? Analysis of U.S. and global grain stocks is complicated by the fact that grain is harvested at different times of the year. U.S. and Canadian wheat is harvested throughout the summer months; corn is harvested in the fall. Southern Hemisphere countries such as Australia and Argentina harvest wheat in November and December. To simplify analysis, economists define ending stocks as the amount of grain in inventory at a specific date just prior to major harvesting activity. That date marks the end of the marketing year. For example, ending stocks of U.S. wheat are measured as of May 31; ending stocks of corn, August 31. These dates differ for other countries.

This end-of-marketing-year stock level is a very useful statistic. It shows in one number the daily decisions, accumulated over the grain marketing year, of people and governments about how much of the current grain supply to consume and how much to save as insurance against future shortages. Throughout this report, the term "stocks" refers to this concept of ending stocks.

To further simplify, economists assume that national stocks of grain are fairly represented by the simple sum of ending stocks of the individual types of grains, even though the sum does not represent an existing grain inventory on a given day. For example, ending U.S. stocks of coarse grains consist of the sum of the ending stocks of corn, grain sorghum, millet, oats, barley, and rye, not all measured at the same date. This gets even more complicated when constructing an estimate of ending global stocks of all grains. Thus, the numbers reported here definitely are not estimates of global grain stocks as of one date. Still, they are useful statistics showing relative year-to-year global scarcity or surplus of grain.

Pipeline and carryover stocks. Official estimates of grain stocks do not show the breakdown between pipeline and carryover stocks, but some economists have made rough estimates. Pipeline stocks are those in the "pipeline" — on trains, on ships, in storage ready for processing — from producer to consumer at the time stocks are measured. The quantity of pipeline stocks is expected to be quite stable from one year to the next. Pipeline stocks represent a minimum level of stocks that a country likely will have.

Carryover stocks can be considered the reserve. They are the stocks, in excess of pipeline levels, serving as the hedge against future shortages. All countries hold some pipeline stocks, but only a few hold most of the carryover stocks. In the United States, for example, grain stocks at the end of the 1975/76 marketing year were considered by economists to be at pipeline levels with carryover stocks near zero. Most of the stock growth since then has been growth in carryover stocks.

Other forms of grain "insurance." Carryover stocks are not the world's only insurance against poor grain harvests. Livestock and idle cropland also provide insurance. If food grains become scarce, grain consumption by livestock can be reduced to make more

available for humans. This can be done either by reducing grain fed per head or by reducing the livestock inventory. For example, a significant reduction in grain fed to livestock occurred in the United States during the global grain-shortage years of the early to mid-1970's.

In the United States, land withheld from production by commodity programs is also a form of reserve, though not immediately available. If a shortage of grain can be anticipated, this retired land can be brought back into grain production to boost next year's harvest.

Defining Stocks: A Summary

Why lump the various types of grain together?

- Because they all substitute for each other, on the margin, in meeting human food needs.

How are grain stocks measured?

- Measured at the end of the marketing year, just before harvest of the next crop. Thus, they are "ending stocks."
- The end of the marketing year comes at different times for different types of grains and for different locations around the world.
- Thus, the statistic "world grain stocks" does not actually report grain on hand around the world on one date. Still, it is a useful statistic for showing year-to-year changes in the relative supply-demand balance of grain.

Pipeline and carryover stocks — useful concepts.

- Pipeline stocks: Grain in the pipeline from producer to consumer. Not expected to fluctuate much over time.
- Carryover stocks: Grain in reserve. Expected to grow or diminish to help even out supplies over time.

There are backup reserves to grain stocks.

- Less grain can be fed to livestock and livestock numbers can be reduced to meet emergency grain needs for human consumption.
- Idle, reserve cropland can be brought back into grain production.

Six countries hold most of world's stocks

One can better understand how the world's grain stocks are managed by examining stockholding practices in six countries/regions.

The global view of grain stocks can be misleading. There is no worldwide agency that manages the world's grain stocks. Global stock levels are determined by private firms such as individual farmers and by national governments. One can better understand how the world's grain stocks are managed by examining stockholding in individual countries. In recent years, over 80 percent of the world's grain stocks have been held in six countries/regions: the United States, China, Soviet Union, India, Canada, and the 12 countries of the European Community (EC). The EC-12 is treated as one country in this report. The United States holds by far the most stocks, with China second. The Soviet Union and the EC each hold about 10 percent, followed by India and Canada. These are also the world's leading grain producers. Other countries tend to hold only pipeline stocks.

Two questions are addressed as we examine the grain stock management practices of each of the six countries. What is the role of stocks in meeting domestic needs? What is the role of stocks in meeting international needs? In other words, are stocks held primarily to meet domestic needs or are they also available to other countries when needed? If the latter, then their stocks can be considered a part of a global reserve. If the former, the stocks serve only as an in-country reserve.

Figure 6

Where world grain stocks are located, 1984/85-1988/89 average stocks

The United States holds the most coarse grain and wheat stocks, while China holds large quantities of all grain stocks.

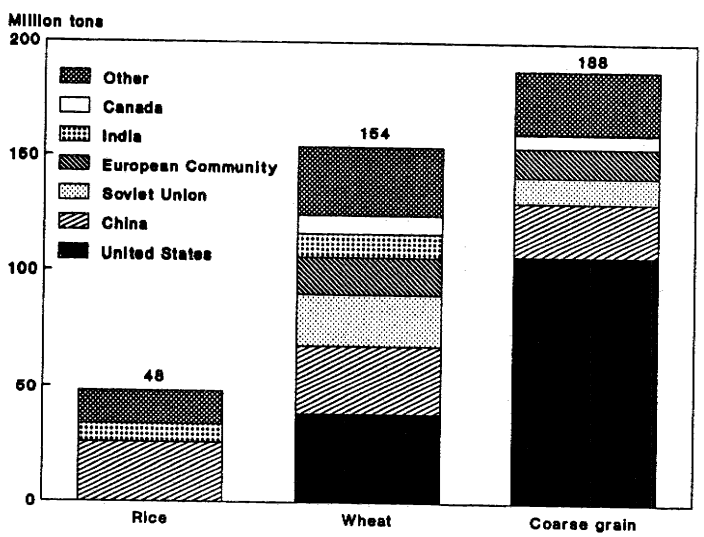
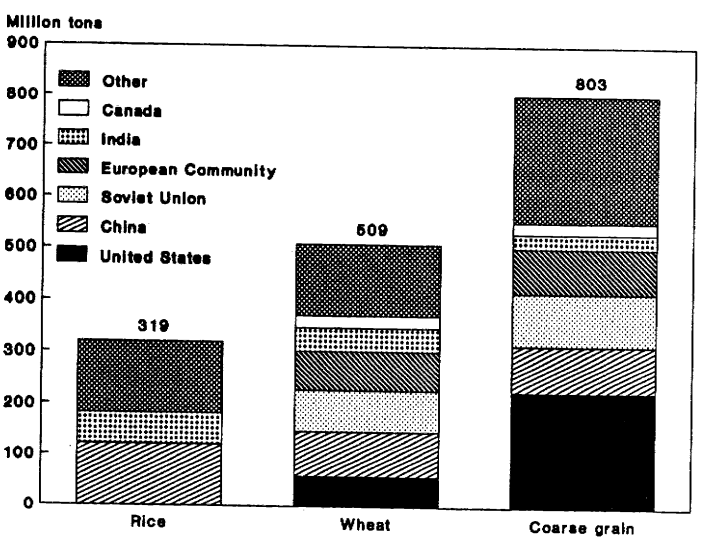


Figure 7

Where the world's grain is produced, 1984/85-1988/89 average

The United States is the dominant producer of coarse grains with China, the Soviet Union, EC, and India also major grain producers.



China

China ranks second, after the United States, in grain stocks, but those stocks are for only domestic use.

China is the world's leading grain consuming nation, and tied with the United States as the leading producer. China ranks second, after the United States, in grain stocks. Over the last 30 years, China has exhibited impressive growth in both grain production and stocks. As a result, the country is better able to feed its people and overcome temporary disruptions of poor harvests. Since 1984, however, grain production has leveled off and stocks have declined. Note that estimates of grain stock levels in China are not considered highly accurate.

Vast distances in China separate population centers from some of the major grain producing areas. A poor transportation system greatly limits internal grain movements. It is consequently cheaper to import grain for use in major cities near ports than to haul it from the more distant interior production regions. China has traditionally been a small net exporter of rice and, in the 1980's, a net exporter of coarse grains. Most years, however, China has been a major importer of wheat for consumption in cities near ports.

Grain stocks are government-held in China for domestic food security purposes. Because of the poor transportation system, however, some population centers have very limited access to those stocks in outlying provinces. Thus, not only are China's grain stocks not available to the world market, at times they are not available to much of China.

In spite of the large volumes of stocks, China's grain imports historically have been quite variable from year to year. This is especially noticeable since the mid-1970's. China has turned to the world market to overcome much of its production variability. As a result, even though China holds large quantities of stocks to help buffer against its own shortages and surpluses, much of its production variability is offset by imports. This, in effect, shifts much of the internal production variability onto the world grain market.

Figure 8

China's grain production and stocks

After many years of growth, China's grain production has leveled off and stocks have declined since 1985.

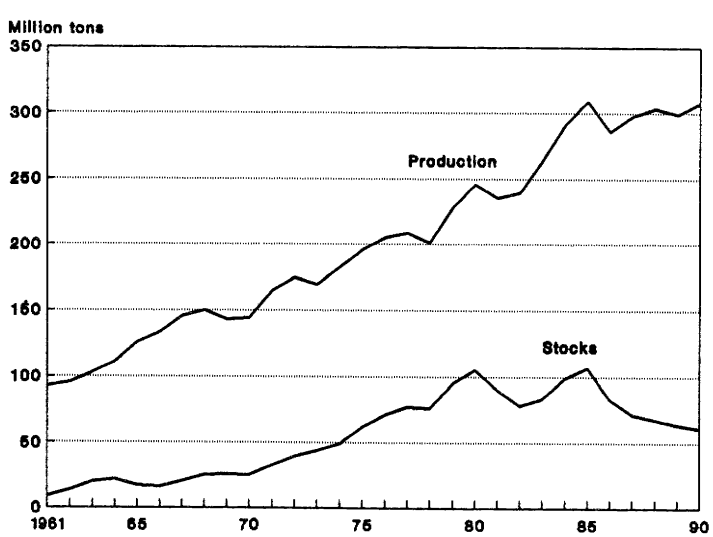
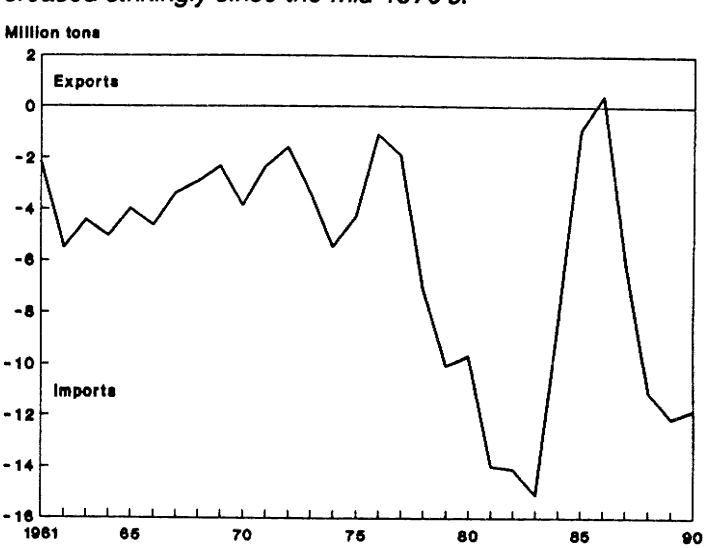


Figure 9

China's net grain trade

The year-to-year volatility of China's grain imports increased strikingly since the mid-1970's.



India

India's grain stocks, like China's, are available only for domestic use. But, in recent years, unlike China, India's stocks appear to have provided substantial stability to domestic grain supply and thus reduced the volatility of grain imports.

India ranks second to China in rice production, consumption, and stockholding. India also ranks high in wheat and coarse grains. Like China, India's production and stocks of grains, especially food grains, have trended upward over the last 30 years. As a result of this success, India was approximately self-sufficient in grain in the 1980's.

India has developed one of the world's largest public food distribution programs. The Indian infrastructure is well developed and the state-run distribution centers get food to the needy. A domestic grain reserve is a key part of India's food security system. The government's goal is to maintain at least a 10-million-ton grain reserve. But, like China's, grain stocks have declined since reaching record-high levels in the mid-1980's. And the stocks are for use only in India.

India's climate causes considerable variation in grain production from year to year. This variability led to periodic famine in the past. In recent years, however, more grain stocks have been used to smooth out the supply of domestic grain. India's grain stocks have, consequently, helped reduce the year-to-year variability of grain imports, helping to make the world grain market less unstable.

Figure 10
India's grain production and stocks

Stocks are down from the peak in 1987; production continued its longrun upward trend after a drop in 1988.

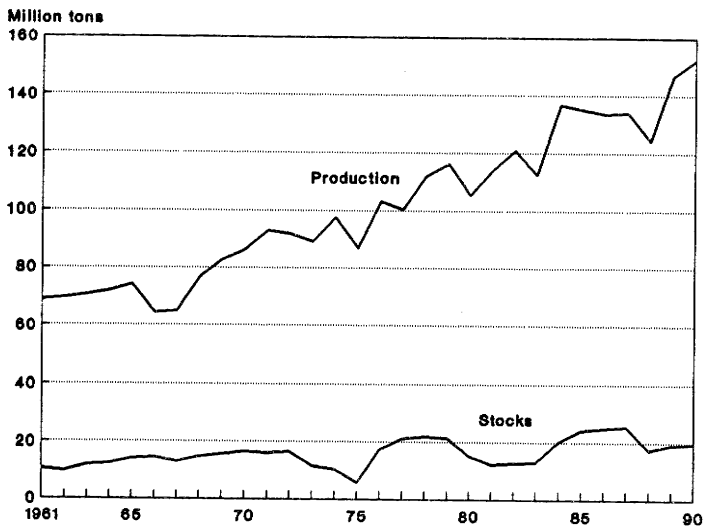
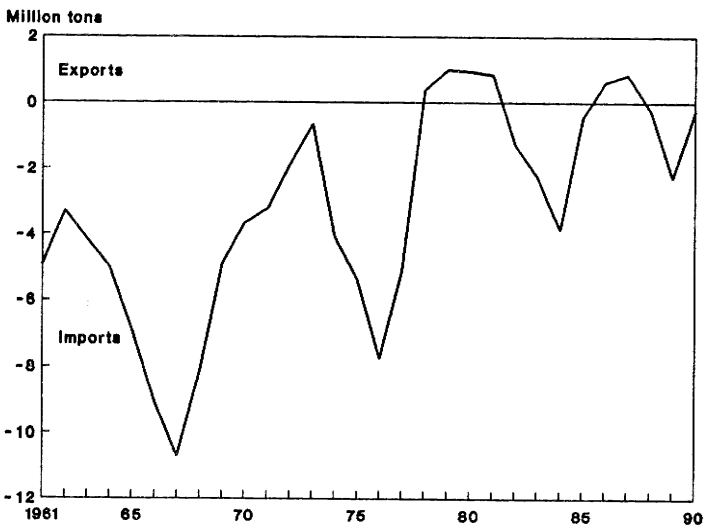


Figure 11
India's net grain trade

There has been less volatility in India's grain trade since the mid-1970's.



Soviet Union

The Soviet Union accumulated substantial grain stocks for domestic use during the 1980's. But those stocks have not reduced the year-to-year volatility of grain imports.

The Soviet Union is the second largest grain consumer and ranks third in production and stocks. Wheat is its main grain crop. Since the Soviets do not supply data on stocks, USDA analysts must calculate changes in stocks from year to year after approximating supply, trade, and consumption numbers.

Although the Soviet Union is one of the world's largest grain producers, it has relied more and more on grain imports to meet domestic needs. Analysis of grain production in the Soviet Union since 1960 reveals two striking characteristics: it has been highly variable, and it has leveled off after trending upward throughout the 1960's and 1970's. Demand for grain has continued to grow. As a result, the Soviets have become one of the world's largest grain importers, after being self-sufficient in the 1960's. Since 1980, Soviet grain stocks have grown and later remained high, unlike in other major stockholding countries. Soviet grain stocks are state-owned and are for only domestic use.

Large stock levels, however, have not offset the Soviet Union's large year-to-year production variability enough to prevent large fluctuations in imports. Consequently, even with substantial stocks, Soviet import decisions cause considerable volatility on world grain markets.

Figure 12

Soviet Union grain production and stocks

While grain production leveled off in the 1980's, stocks expanded.

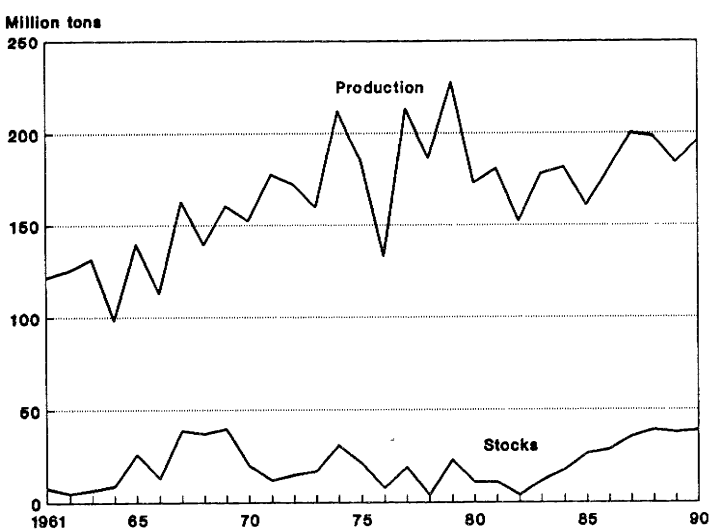
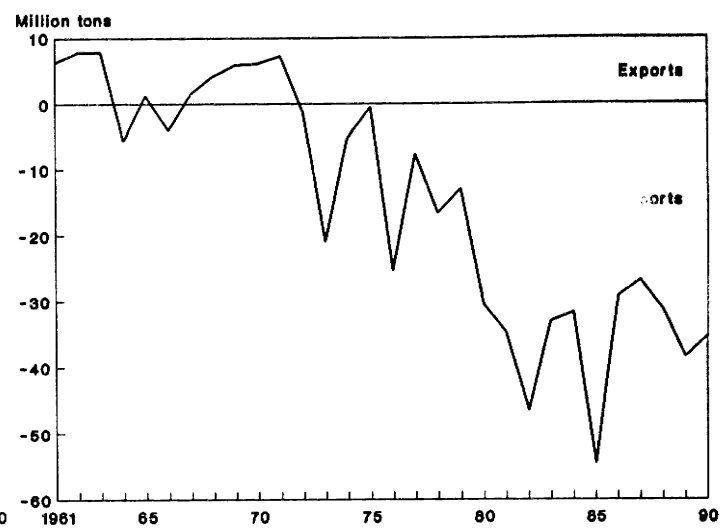


Figure 13

Soviet Union net grain trade

Grain imports in the 1980's are much larger than earlier and still quite volatile.



European Community (EC-12)

The EC has become a major grain exporter. Its grain stocks are, consequently, available to the world market as well as to the domestic market.

The EC-12, when counted as one unit, ranks fourth in grain production, consumption, and stockholding. It mainly raises wheat and coarse grains. Since the mid-1970's, grain production has grown more rapidly than consumption, resulting in the EC switching roles in the 1980's from a major net importer of grain to a large net exporter.

Since the EC has become a major grain exporter, EC stocks have become available to be sold on the international market as well as to meet domestic needs. There was little change in EC stock levels between 1960 and 1980, when the EC was a net importer.

Stocks those years appear to have been pipeline levels with a little margin for offsetting a poor harvest. In the 1980's, when the EC became a net exporter of grain, stock levels appear to have become more sensitive to world market conditions, increasing when there was weak export demand and decreasing when export demand was strong. Stock levels also were affected by production variability. Grain stocks rapidly expanded in the mid-1980's after 2 years of above-trend production and weak export markets. Stock levels then fell in the late 1980's when export markets recovered and production leveled off.

Figure 14
EC grain production and stocks

Grain production and stocks in the EC have declined after reaching record high levels in the mid-1980's.

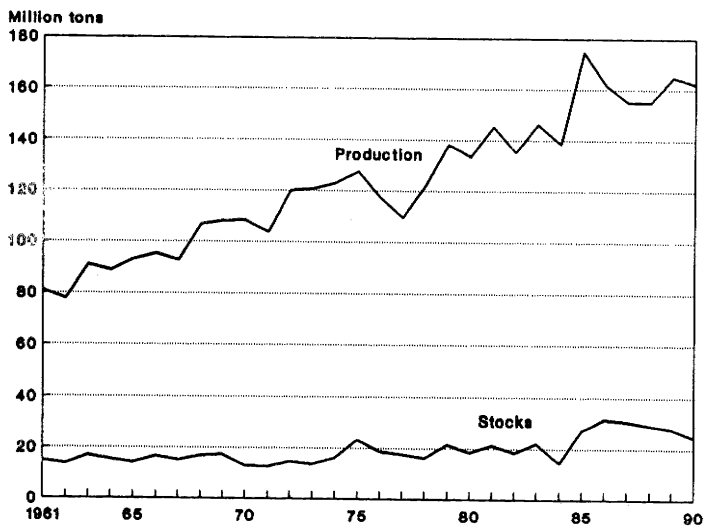
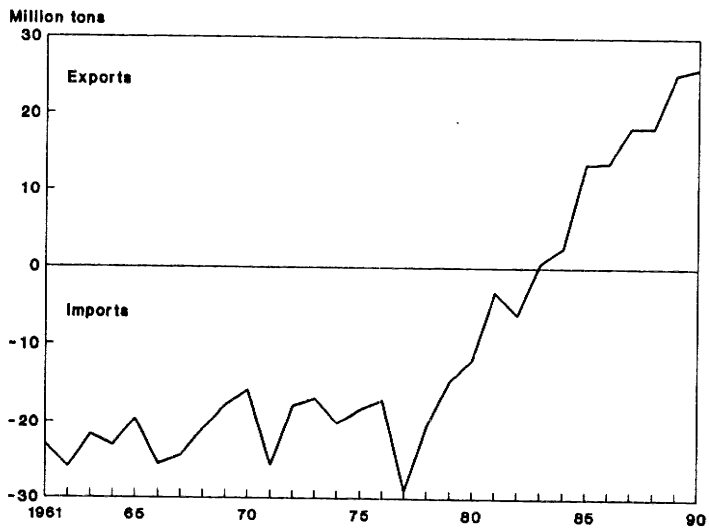


Figure 15
EC net grain trade

Historically a grain importer, the EC became a major net exporter of grain in the 1980's.



Canada and other grain exporters

Canada's grain stocks, while not large by U.S. standards, play an important global role beause they are available to the world market. Other grain exporters generally hold only pipeline stocks.

Canada produces only 3 percent of the world's grain and holds only 4 percent of the world's grain stocks. But Canada is a major grain exporter, exporting nearly half of its production in recent years. In the late 1960's, Canada had nearly the largest wheat stock in the world. The huge stock was considered a political and economic burden. Grain policies were changed; since then, its grain stocks have trended downward.

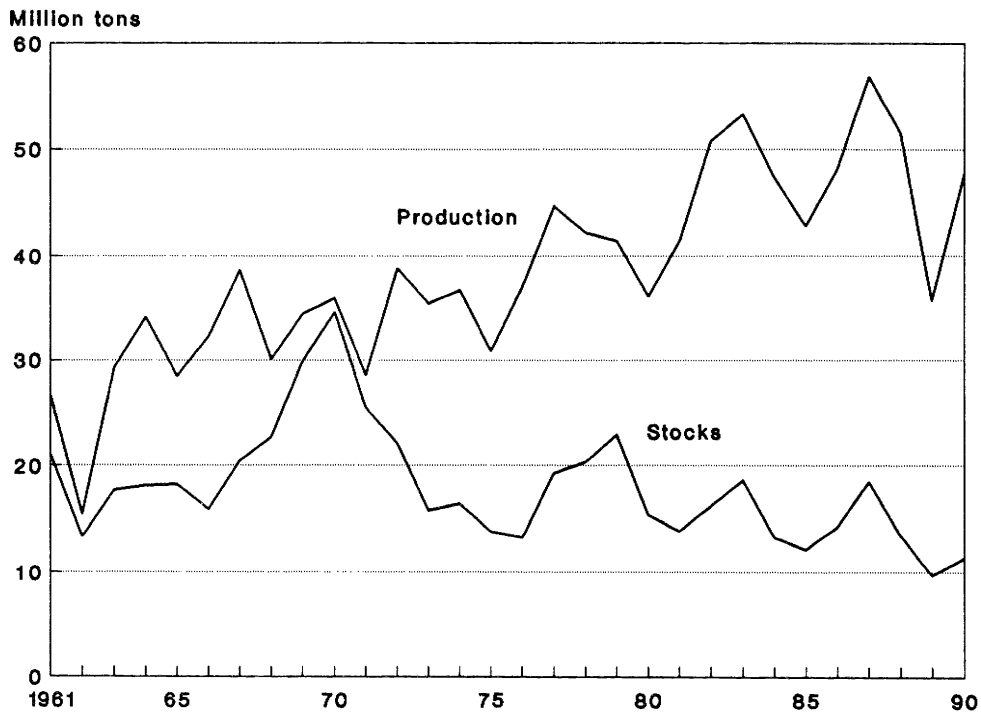
Canada's grain stocks, though small by U.S. standards, meet both domestic and international needs. Stock levels have fluctuated in response to Canada's year-to-year production variation and world market conditions. As in many other countries, grain stocks accumulated in the mid-1980's, but were drawn down in the following years.

Australia, Argentina, and several other countries also are important grain producing and exporting countries. Because of their domestic policies, however, they tend to carry only pipeline levels of stocks. The one exception might be when Australian wheat stocks were at a record high level in the early 1980's. Otherwise, these exporters are not among the countries that play an important role in holding the world's carryover stocks of grain.

Figure 16

Canadian grain production and stocks

Canada's grain stocks show a downward trend since the late 1960's with fluctuations caused primarily by production variability.



United States

The United States holds well over one-third of the world's grain stocks. The large volumes of U.S. stocks, part Government-owned and part privately owned, are available to the world market. Large stock volumes, however, have been an unwanted byproduct of farm programs.

On average, the United States holds by far the largest grain stocks in the world, ties China as largest grain producer, and ranks third in grain consumption after China and the Soviet Union. The United States also is the leading grain exporter. About 30 percent of the grain crop (60 percent of the wheat crop) is exported. Corn and wheat are the major grains produced and traded.

Grain stocks in the United States are available for both the domestic and world grain markets. Stock levels have also been quite variable as a result of domestic and world market conditions. Like in Canada, U.S. stocks were at record high levels in the late 1950's. Stock reduction was a major farm policy goal of the 1960's and early 1970's. A combination of pursuing that goal plus the expanding export market reduced stocks to pipeline levels in the early 1970's. Then, stocks again accumulated, with considerable year-to-year volatility, until a new record high was reached at the end of the 1986/87 marketing year. The next 2 years saw a dramatic drop. Except for the extreme lows of 1974 and 1975, stocks of wheat were lower in 1989 than in any other year since the 1950's.

U.S. grain stocks fall into three categories: privately owned stocks, privately owned but Government-controlled and subsidized stocks, and Government-owned stocks. Privately owned stocks are primarily owned by grain producers, not grain merchants. The second category consists of stocks in the farmer-owned reserve (FOR). Introduced in the late 1970's, the FOR provides storage subsidies to producers. FOR rules partially control when the stored grain can enter the reserve or be released to the market. The third category, Government-owned stocks, consists of stocks owned by the Commodity Credit Corporation (CCC). CCC stocks accumulate when domestic grain supplies exceed domestic and export demand at price floors set by the farm programs. Included in the CCC stocks is a 4-million-ton wheat reserve earmarked for emergency needs in other countries.

Most of the large volume of grain stocks in 1960 was Government-owned. Government bins were emptied, and the bins sold, by the early 1970's. During the 1970's, most of the U.S. grain stocks were privately owned. In the late 1970's, however, FOR and CCC stocks again accumulated as a result of price support policies.

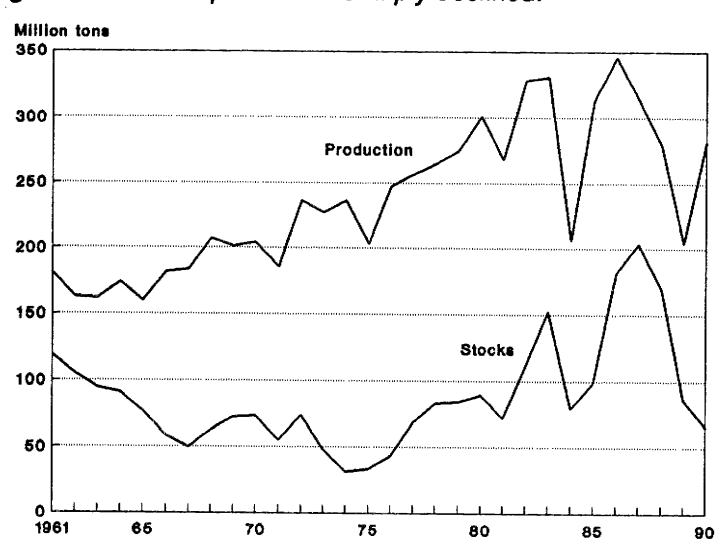
The recent sharp reduction of U.S. grain stocks was caused mostly by three forces. First was the major drought of 1988 when grain production was 26 percent below the previous year and 40 percent below the record high production of 1985. Second, there was an increase in demand for U.S. exports. And third, Government grain programs were changed. In response to the high stock levels, more land was idled by the programs to hold down production. Further, the export enhancement program (EEP) used Government stocks to subsidize exports.

Two generalizations can be made about U.S. grain stocks. First, Government-owned or subsidized grain stocks, except the emergency reserve, are usually considered by U.S. policymakers as unwanted byproducts of domestic farm policy. Public stocks increase when farm policy is supporting domestic, and hence world, grain prices. The Federal budget cost of those stocks tends to be politically undesirable. Examples of grains policy initiatives to reduce stocks in the 1980's were the use of stocks as payment in kind for idling cropland (1983) and the export enhancement program.

Figure 17

U.S. grain production and stocks

After reaching their historic peak in the mid-1980's, grain stocks and production sharply declined.



Second, unlike in most countries, a competitive grain storage industry exists in the United States. Since U.S. farmers are exposed to world price fluctuations, they can choose to hold stocks from one year to the next if storage appears to be profitable. Forces that destabilize world grain prices provide profit opportunities for the U.S. storage industry. In the process of capturing those profit opportunities, the private storage industry stores and releases grain in a way that tends to offset those destabilizing forces. Thus private stocks provide some domestic and world price stability. But to the extent that the U.S. farm programs add stability to grain prices, those programs also discourage the private sector from storing grain.

Figure 18

U.S. wheat production and stocks

Wheat stocks reached a record high in 1986 and then plummeted, partly due to reduced production.

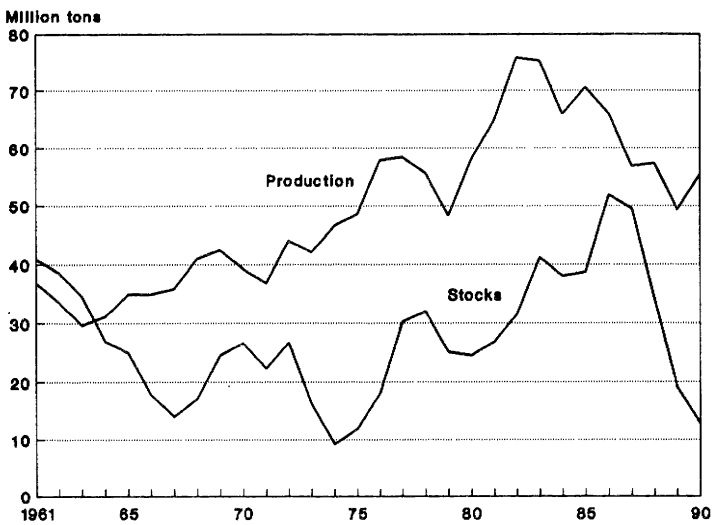


Figure 19

U.S. coarse grain production and stocks

Production and stocks of coarse grains were highly volatile in the 1980's.

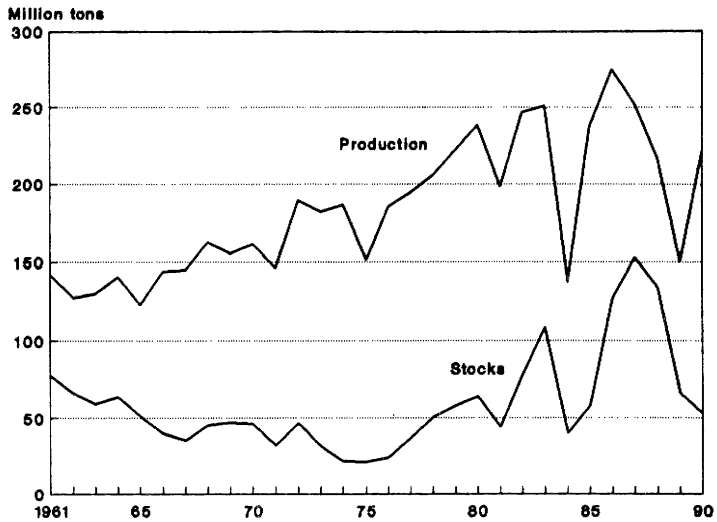


Figure 20

U.S. Government, farmer-owned reserve, and private wheat stocks

Most years, a high percentage of U.S. wheat stocks have been owned or subsidized by the Government.

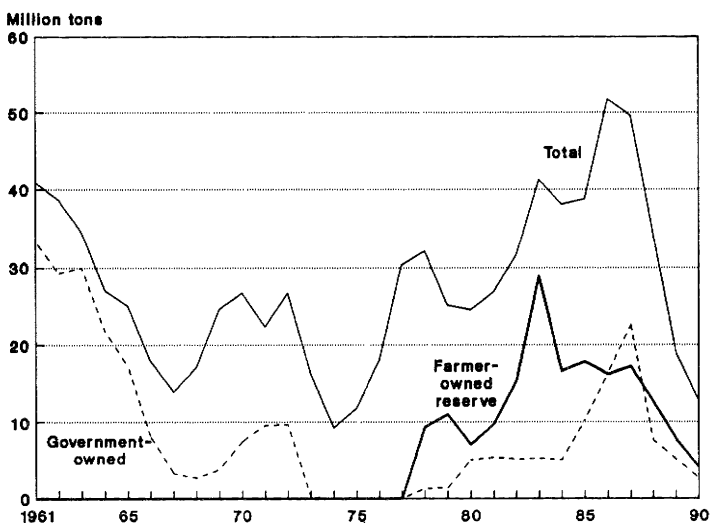
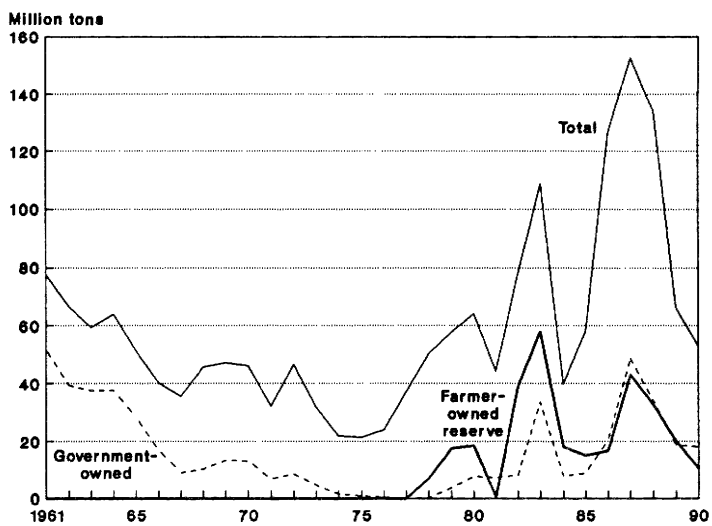


Figure 21

U.S. Government, farmer-owned reserve, and private feed grain stocks

Government-owned or subsidized feed grain stocks constitute a substantial share of the total.



Implications

The United States holds much of the world's grain reserve and the rest of the world has come to rely on it. Any policy change that reduces U.S. grain stocks could force other countries to rethink their grain stocks policies.

The United States holds much of world's grain reserve. For this analysis, it is convenient to divide the world's grain stocks into three grain bins. Bin 1 contains the stocks of China, India, and the Soviet Union—34 percent of the world's stocks. Bin 2 contains the stocks of the United States, Canada, and the EC—49 percent. Bin 3 contains stocks in all other countries—17 percent. Although the third bin includes some carryover stocks held for domestic emergencies, it likely contains mostly pipeline stocks. These are stocks held primarily by grain importing countries and grain exporters such as Australia and Argentina. Very little of the grain in bin 3 could be classified as grain available to the world market.

Bin 1 stocks are available exclusively to be used within the country. India has been quite successful in recent years in managing grain stocks to meet domestic needs. Grain stocks in China and the Soviet Union also play important roles in safeguarding against their own production volatility. But, their volatility in grain imports is evidence that they still rely on the world grain market to meet much of their year-to-year variability in grain production. Their stocks fall far short of smoothing out the gap between domestic supply and demand over time.

Bin 2 contains (1) the pipeline stocks of the designated countries, about one-third of the total in the bin in the late 1980's, and (2) carryover grain stocks. The latter are available to the world market to offset shortrun shortfalls in grain supplies and meet emergency needs, including shortfalls and emergency needs of the Soviet Union, China, and India when their own reserves are inadequate. In recent years, U.S. grain stocks represented 76 percent of the U.S.-EC-Canada total stocks and between 85 and 90 percent of their carryover stocks. In other words, U.S. grain stocks account for most of the carryover stocks that are available to be traded on the world grain market.

Global Interdependency. The country pattern of grain stockholding reveals a curious interdependency among the nations. Most countries depend upon the United States and, to a lesser extent, the EC and Canada to carry part or all of their grain reserves. This current pattern of global stocks interdependency appears to have existed for many years. What is curious about this arrangement is that it continues though many countries are unhappy with it. Whenever stock levels are low, it is the focus of political debate around the world. And, many argue that an international agency is needed to manage at least part of the world's grain stocks.

The cornerstone of this informal arrangement is the U.S. willingness to carry large quantities of stocks. Many U.S. policymakers argue that the United States pays the high cost of holding stocks while other countries obtain the benefit. Grain importers worry about access to U.S. grain when world supplies are short, but still apparently are unwilling to pay the cost of holding more of their own grain stocks. These fears may have been diminished by U.S. legislation in 1981 that made grain export embargoes more difficult to impose.

Evidence over the past 30 years shows which countries make most of the shortrun adjustments when grain stocks are abundant or scarce on world markets. Consider the United States. The United States sees itself as being burdened with the role of the "residual supplier" that makes most of the adjustments (such as idling land and accumulating Government stocks) when world grain markets are in surplus. For example, the United States accounted for 80 percent of the world's large buildup of total grain stocks between 1984 and 1986, and 75 percent of the large reduction in world stocks between 1987 and 1989. This residual supplier role was not imposed upon the United States by the outside world. It was self-inflicted by the choice of domestic grain policy.

On the other hand, poor countries tend to be the "residual demanders" when grain is scarce on world markets. Many are dependent on the world market and foreign assistance for much of their grain. Without help, they cannot out-bid wealthier nations for scarce grain.

The vast majority of countries appear to protect themselves from having to make production, consumption, or stock adjustments due to grain market conditions beyond their borders. In doing so, however, they tend to export their own grain market volatility onto the world

market. This puts an additional adjustment burden on the residual supplier and residual demanders.

Looking to the future. The interdependency described above likely could continue well into the future. Two forthcoming policy events, however, could change the "rules" enough to destabilize and reshape that interdependency. Those events are the next U.S. farm bill and the multilateral negotiations through the General Agreement on Tariffs and Trade to liberalize agricultural trade. Pressure to reduce Federal budget expenditures in the United States could lead to farm program changes that would reduce Government stocks. Further, if complete liberalization of agricultural trade were achieved in this GATT round, then farm programs that generated government stocks in the United States, EC, and other countries likely would be eliminated.

These possibilities could greatly reduce or end the role of the U.S. Government in owning stocks or subsidizing the private storage of grain stocks. Although some increase in privately held grain stocks would be expected in response to this policy action, the net result would be to significantly reduce average U.S. stock levels. If no offsetting adjustments were made in other countries, there would be an equivalent reduction in world stocks. However, policy changes likely would take place in other countries in response to reduced global stocks. Among the possibilities: (1) increased domestic government reserves, most likely in wealthier importing countries, (2) increased private stockholding in countries where producers face the volatility of the world price, and (3) a small, internationally managed grain reserve to meet emergency needs in poor countries.

The World's Three Grain Stock Groups (or "Storage Bins")

Bin 1

- China, India, the Soviet Union
- 34 percent of world's stocks
- Stocks used exclusively within the country
- China and Soviet Union contribute to world market volatility by entering market to fill production shortfalls

Bin 2

- United States, Canada, EC
- 49 percent of world's stocks
- Pipeline and carryover stocks
- U.S. stocks account for most of world's carryover stocks available to world market

Bin 3

- All other countries, including Australia and Argentina
- 17 percent of world's stocks
- Mostly pipeline stocks, very little available to world market

Implications

- United States holds most of world's grain reserve
- GATT negotiations and new U.S. farm bill could reduce U.S. stocks
- Pressure would be on rest of world to take up the slack

Stocks data

Data were obtained from various issues of *Foreign Agriculture Circular* issued by the Foreign Agricultural Service, USDA, and regional situation and outlook reports issued by the Economic Research Service. For a convenient computer program and the data files to access these and similar data, see Alan Webb and Karl Gudmunds (1989) *PS&D View: Users Manual and Database,* ERS, September.

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